102 - POTENTIATION AFTER ACTIVATION: THE INFLUENCE OF DIFFERENT ACTIONS MUSCLE OVERLOAD AND PREVIOUS PERFORMANCE OF MAXIMUM STRENGTH

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INTRODUCTION

The post-activation potentiation (PAP) refers to the increase in power output and power after previous contractile activity usually performed with intense resistance exercise (BAKER; NEWTON, 2005; DUTHIE; YOUNG; AITKEN, 2002; IDE, 2010; ROBBINS, 2005; SALE, 2002; Tillin; BISHOP, 2009).

One factor that may contribute to the emergence of empowerment would be the phosphorylation of myosin head of regulatory light chain, and the type II fibers that have the best features for the emergence of this effect (Batista et al., 2003). With the phosphorylation of myosin regulatory light chain conformation, and there is a change of cross bridges and are approaching the next fine globular heads of actin filaments (Batista et al, 2010;. Rassier; MACINTOSH, 2000).

Another factor that contributes to the effect of PPA may be proposed by an increased sensitivity to calcium ions, troponin binding favoring the exposure of the active site of actin molecules forming cross bridges, which when in greatest abundance, can provide a production increase of strength and muscle power in subsequent efforts (HODGSON; DOCHERTY; Robbins, 2005; Tillin; BISHOP, 2009).

When calcium is released from the sarcoplasmic reticulum kinase activation myosin by calcium / calmodulin complex occurs. Increases in kinase activity modulate the phosphorylation of myosin regulatory light chain. Some studies have reported that calcium is essential for the potentiating effect, therefore, an increase in their concentrations in the cytosol of the cell can result in greater interaction with troponin and cause greater exposure of actin sites for connection of cross bridges myosin (HODGSON; DOCHERTY; Robbins, 2005; Tillin; BISHOP, 2009). Potentiation also been attributed to an increase in the excitability of neuron as reflected by changes in the amplitude of the H-reflex (HODGSON; DOCHERTY; Robbins, 2005; Tillin; Bishop, 2009).

To trigger the PPA is necessary to make a previous activity with near maximum intensity and short duration. (Tillin; BISHOP, 2009). Activities prior to the maximal isometric voluntary contractions with 5-10 seconds duration (FRENCH; KRAEMER; COOKE, 2003) or submaximal exercise dynamic force with loads of up to 5 repetitions maximum, are considered efficient for the development of the PPA effect (BATISTA et al., 2003) .Corroborando with the findings of Batista et. al. (2003), Gourgouliset al. (2003) reported that these exercises with dynamic force loads that will bring about 1 to 5 repetitions maximum (1-5RM) have been used successfully and quite often.

According to Evans et al. al. (2001), the effect starts around the third to fifth minute, with an average effect after 10 minutes, but can last up to 20 minutes (VERKHOSHANSKI, 1996). This acute effect of temporary PPA may allow the use by athletes in tests of strength and power provided that it engages in heating strength exercises before the training session or (YOUNG; JENNER; GRIFFITHS, 1998) competition. Therefore, the aim of this study was to determine the influence on the performance of maximum strength after previous concentric, eccentric muscle actions is combined with 95% 1RM concentric or eccentric 1RM.

METHODOLOGY

Study participants were 8 females of age between 21 and 54 years (= 39.9 ± 9.5 years), weight = 72.0 ± 14.7 kg, height = 160.9 ± 5.0 cm, practitioners localized gym 2 years ago, the City of Guaxupé-MG, SESI unit Guaxupé.

Before the study, all participants were informed about the procedures used in the experiment, their risks and benefits, and consented in writing their holdings.

After obtaining informed consent, subjects were instructed to maintain their normal daily routine, such as food, rest time, study and work, and also committed to not engaging in physical activity during the period of the research.

The individuals participating in this study underwent two distinct tests before and after the intervention: testing of maximal strength 1RM concentric and eccentric 1RM, both performed in the exercise barbell.

To determine the maximum load in concentric action: we chose to perform one repetition maximum (1RM), since according to Reynolds et al. (2006), despite its limitations, this is a direct, accurate and reliable for assessing the maximum force method. This method consists in performing a repetition of the movement in the concentric phase. The test was performed with his back against the wall and the grip on the bar being held at shoulder width. Attempt to be valid, arms lifted off from full elbow extension, performing to full flexion, and there could be no movement of the legs and back (DIAS et al., 2009). The pauses between attempts were 3-5 minutes to complete recovery of phosphocreatine (DIAS et al., 2013).

In determining the maximum load on the eccentric action, the subjects should sustain the highest possible load on the eccentric phase of the movement in barbell exercise, following the procedures proposed by Hollanderet al. (2007) .For this evaluation arms were in full flexion, back against the wall, held grip at shoulder width. The determination of the maximum charge was set when evaluated could not sustain and hence the arm began to extend.

Pauses between attempts were between 3 to 5 minutes for complete recovery of phosphocreatine in energy so that no commitment to a subsequent attempt (Dias et al, 2009;. Dias et al, 2013.).

An experimental study lasting 6 weeks according to the design shown in Figure 1. Before the experiment, a pilot study was conducted to familiarize themselves with the testing 1RM concentric, eccentric was performed. Before and after the performance of each protocol 1RM tests were performed to verify the behavior of the PPA.

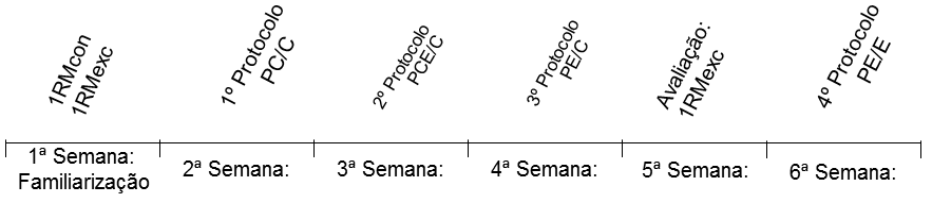

FIGURE 1: 1RMcon = one repetition maximum in concentric action; 1RMexc = one repetition maximum in eccentric action; PC / C = concentric action with 95% of 1RM load concentric; PCE / C = concentric and eccentric action with 95% of 1RM load concentric; PE / C = eccentric action with 95% of 1RM load concentric; PE / E = eccentric action with 95% of 1RM load eccentric.

In the week of the experiment subjects performed:

Specific heat:

- The subjects performed two sets of 12 repetitions, with the first 30% of 1RMcon and the second with 50% being 1RMexc, both added to the weight of the bar. Among the series was given a break of 30 seconds at the end of the two series of break four minutes for the resynthesis of Pcr.

Pre-test:

- The sample 1RMcon performed the test in the 2nd, 3rd, 4th and 6th week before each adaptation protocol for loading and setting the values of the pre-test and 1RMexc the 5th to the adequacy of the load for the realization of PE / E . To ensure the recovery of energy sources phosphocreatine after each pre-test was given a pause of 4 minutes.

Protocol for activation

- The protocol used for activation was 3 reps with 95% 1RM concentric or eccentric.
- A break 8 minutes after the protocols were atribuídaspara manifesting the phenomenon of PPA.

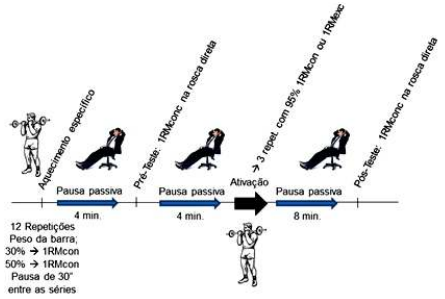

FIGURE 2: Experimental Protocol.

Data analysis

- Version 20 average, standard deviation and ANOVA with post hoc Tukey test for comparison of means, with significant reference value of p <0.05 using SPSS software: To analyze the data the following statistical tests were used.

RESULTS AND DISCUSSION

The results are shown in Figure 3.

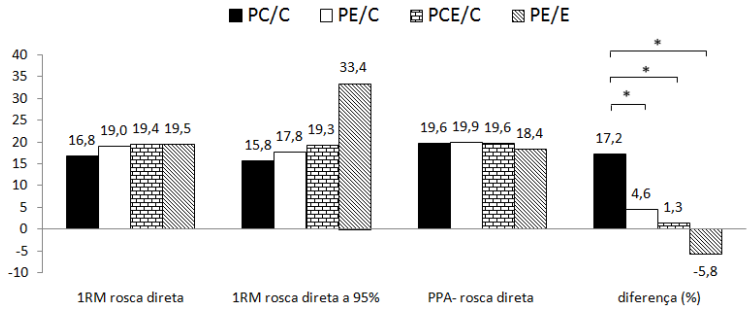

FIGURE 3: Values of the maximum force in the barbell pre- and posttest values of loads at 95% 1RM concentric or eccentric and values of the percentage differences between the results of the pre- and post-training protocol (behavior PPA).

Legend: PC / C- concentric with 95% load concentric, PCE / C - concentric / eccentric with 95% load concentric, PE / eccentric C with 95% load concentric, PE / E with 95 eccentric % load eccentric; * P <0.05.

By analyzing the values of the maximum strength of the pre-tests (Figure 3), it was verified that the protocols gone from a situation of equality, because significant differences for p <0.05 in the values obtained for these moments were not found.

As shown in Figure 3 the protocol generated the most acute effect of post-activation potentiation and the protocol was utilizouda concentric movement phase with 95% of concentric 1RM load (PC / C), yielding an improvement of 17.2 % from pre to posttest, displayed significantly more efficient for the generation PPA effect when compared with other protocols (p <0.05).

The PE / PCE and C / C protocols generated an improvement of 4.6% and 1.3% respectively in the PPA effect. However, these results were significantly lower than the value obtained by the PC / C protocol.

The PE protocol / E configured with eccentric actions at 95% of 1RM load eccentric was the only one who did not produce the PPA effect on evaluated time getting a drop of 5.8%.

The PPA effect is due to the correct manipulation of variables such as determining the optimal period for the maximum manifestation of PPA time; determining the optimum load (intensity) (JEFFREYS, 2008), volume control and post-activation breaks and the type of muscle action (FRENCH; KRAEMER; COOKE, 2003). The literature reports that it is in no contractile activity that can produce the effect of potentiation, because if not well dimensioned, fatigue will occur and no potentiation (LOPES; IDE; SARRAIPA, 2010). However, the determination of the methods exploit paramelhor manipulare PAP remain undefined (Robbins, 2005).

Studies have reported that the high intensity, low volume, and complete pauses for proper recovery of PCr has been successful to induce post-activation potentiation, as used in this study. Still, corroborating this research, Ide (2010) reports that the eccentric action is presented in a negative way for the emergence of post-activation potentiation.

This result can be explained when we see the eccentric phase is considered potentially damaging muscle cells, because of the mechanical stress that sarcomeres are subjected (IDE, 2010). During eccentric actions, cross bridges remain attached while the sarcomeres are stretched and the action potential is still propagated, this causes disruption occurs without

hydrolysis of a new ATP molecule, causing damage to myofibrillar structures (Gibala et al ., 1995;. Gibala et al, 2000) and disruption of the Z lines missing proteins, and alpha actinin and desmin (Rassier; MACINTOSH, 2000), the Z lines are the most vulnerable to injury induced by eccentric action (FRIDEN; LIEBER, 1998) the damage caused by eccentric muscle actions may have been responsible for the sharp decrease in performance (IDE, 2010) factor.

CONCLUSION

At the end of this study can be stated that for the sample in question PPA has its greatest effect by the protocol using only the concentric action, showing a significativapara percentage difference p <0.05 when compared with the other studied protocols.

Knowing the type of muscle action directly influence the post-activation potentiation, suggest new studies that use different time points, different muscle actions in different muscle groups with different loads in order to evaluate the PPA.

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POTENTIATION AFTER ACTIVATION: THE INFLUENCE OF DIFFERENT ACTIONS MUSCLE OVERLOAD AND PREVIOUS PERFORMANCE OF MAXIMUM STRENGTH

ABSTRACT

It is known that it is possible to increase the strength of acutely by a prior stimulus of maximal muscle strength post-stimulation, this phenomenon is given the name of post-activation (PPA) .Objetivo potentiation: identify the acute effect PPA in the maximum strength of the upper limbs front of concentric, eccentric and combined in different with 95% concentric and eccentric maximum repetition (1RM), performed in the exercise protocols barbell muscle actions. Methodology: the study involved eight female subjects (39.9 ± 9.5 years, 72.0 ± 14.7 kg, 160.9 ± 5.0 cm), were localized exercise to two years in SESI Guaxupé MG.

Four protocols were used to assess the acute effects of PPA at full strength in the exercise barbell - PC / C: concentric protocol performed at 95% 1RM concentric; PCE / C: concentric / eccentric protocol performed at 95% 1RM concentric; PE / C: eccentric protocol performed at 95% 1RM concentric; PE / E: eccentric protocol performed at 95% 1RM eccentric. All protocols were three repetitions with 95% of 1RM load concentric or eccentric. For data analysis we used the mean, standard deviation and to compare the means testing of ANOVA with post hoc Tukey test using SPSS software version 20. The level of significance was p <0.05. Result: after the completion of the protocols found increased strength in pre moment to moment after 17.2% in charge of the 1RM test for PC / C, appears to be significantly more efficient generation of PPA when compared to other protocols (p <0.01). Conclusion: It is recommended to use the PC / C to increase strength acutely since this is more efficient for the emergence of the phenomenon of PPA.

KEYWORDS: empowerment; eccentric muscle action; concentric muscle action; maximum force.

POTENTIALISATION APRÈS ACTIVATION: L'INFLUENCE DE DIFFÉRENTS SURCHARGE ACTIONS MUSCULAIRE ET LA PERFORMANCE ANTÉRIEURE DE LA FORCE MAXIMALE

RÉSUMÉ

On sait qu'il est possible d'augmenter la force de aiguë par un stimulus préalable de la force musculaire maximale post-stimulation, ce phénomène porte le nom de post-activation (PPA) .Objetivo potentialisation: identifier l'effet aigu PPA dans le maximum force des branches supérieure avant de concentrique, excentrique et combinées de différentes avec 95% répétition concentrique et excentrique maximale (1RM), réalisée dans les protocoles d'exercices d'haltères actions musculaires. Méthodologie: l'étude a porté sur huit sujets féminins (39,9 ± 9,5 années, 72,0 ± 14,7 kg, 160,9 ± 5,0 cm), ont été localisés exercice à deux ans dans le SESI Guaxupé MG. Quatre protocoles ont été utilisés pour évaluer les effets aigus de PPA à pleine puissance dans la barre d'exercice - PC / C: protocole concentrique réalisé à 95% 1RM concentrique; PCE / C: protocole concentrique / excentrique réalisée à 95% 1RM concentrique; PE / C: protocole excentrique réalisée à 95% 1RM concentrique; PE / E: protocole excentrique réalisée à 95% 1RM excentrique. Tous les protocoles étaient trois répétitions avec 95% de 1RM concentrique ou excentrique charge. Pour l'analyse des données, nous avons utilisé le, écart-type moyen et de comparer les moyens d'essais de variance avec le test post hoc de Tukey en utilisant le logiciel SPSS version 20. Le seuil de signification était p <0,05. Résultat: après l'achèvement des protocoles trouvé une résistance accrue en instant en instant avant après 17,2% en charge du test 1RM pour PC / C, semble être beaucoup plus efficace génération de PPA par rapport aux autres protocoles (p <0,01). Conclusion: Il est recommandé d'utiliser le PC / C pour augmenter la force aiguë depuis ce qui est plus efficace pour l'émergence du phénomène de la PPA.

MOTS-CLÉS: autonomisation; action musculaire excentrique; action musculaire concentrique; force maximale.

POTENCIACIÓN DESPUÉS DE ACTIVACIÓN: LA INFLUENCIA DE DIFERENTES ACCIONES DE SOBRECARGA MUSCULAR Y RENDIMIENTO ANTERIOR DE MÁXIMA FUERZA

RESUMEN

Se sabe que es posible aumentar la fuerza de forma aguda por un estímulo previo de la fuerza muscular post-estimulación máxima, este fenómeno se le da el nombre de post-activación (PPA) .Objetivo potenciación: identificar el efecto PPA aguda en el máximo la fuerza de las extremidades frontal superior de concéntrico, excéntrico y combinado en diferentes con 95% de repetición concéntrica y excéntrica máxima (1RM), realizado en las acciones musculares con barra protocolos de ejercicio. Metodología: el estudio participaron ocho sujetos femeninos (39,9 ± 9,5 años, 72,0 ± 14,7 kg, 160,9 ± 5,0 cm), se localizaron a dos años de ejercicio en el SESI Guaxupé MG. Se utilizaron cuatro protocolos para evaluar los efectos agudos de la PPA con toda su fuerza en la barra de ejercicios - PC / C: protocolo concéntrico realizó en el 95% de 1RM concéntrica; PCE / C: protocolo concéntrica / excéntrica realizó en el 95% de 1RM concéntrica; PE / C: protocolo excéntrico realizó en el 95% de 1RM concéntrica; PE / E: protocolo excéntrico realizó en el 95% de 1RM excéntrica. Todos los protocolos fueron tres repeticiones con un 95% de 1RM concéntrica o excéntrica carga. Para el análisis de los datos se utilizó la media, desviación estándar y para comparar la comprobación de medios de ANOVA con test post hoc de Tukey utilizando el software SPSS versión 20. El nivel de significación fue p <0,05. Resultado: después de la finalización de los protocolos se han encontrado aumento de la fuerza en pre momento a momento después de 17,2% a cargo de la prueba de 1RM para PC / C, parece ser significativamente más eficiente generación de PPA en comparación con otros protocolos (p <0,01). Conclusión: Se recomienda el uso de la PC / C para aumentar la fuerza de forma aguda ya que esto es más eficiente para la aparición del fenómeno de la PPA.

PALABRAS CLAVE: empoderamiento; acción muscular excéntrica; acción muscular concéntrica; fuerza máxima.

POTENCIALIZAÇÃO PÓS ATIVAÇÃO: A INFLUÊNCIA DE DIFERENTES AÇÕES MUSCULARES E SOBRECARGAS PRÉVIAS NO DESEMPENHO DA FORÇA MÁXIMA

RESUMO

Introdução:sabe-se que é possível aumentar a força de forma aguda através de um estimulo prévio de força máxima pós-estímulo muscular, a este fenômeno dá-se o nome de potencialização pós-ativação (PPA).Objetivo: identificar o efeito agudo da PPA na força máxima dos membros superiores frente às ações musculares concêntricas, excêntricas e combinadas em protocolos distintos com 95% de uma repetição máxima (1RM) concêntrica e excêntrica, realizada no exercício rosca direta. Metodologia: participaram do estudo 8 indivíduos do sexo feminino (39,9±9,5 anos, 72,0±14,7 Kg, 160,9±5,0 cm), praticantes de ginástica localizada a dois anos, no SESI Guaxupé-MG. Foram utilizados quatro protocolos para averiguar os efeitos agudos da PPA na força máxima no exercício de rosca direta - PC/C: protocolo concêntrico realizado com 95% de 1RM concêntrico; PCE/C: protocolo concêntrico/excêntrico realizado com 95% de 1RM concêntrico; PE/C: protocolo excêntrico realizado com 95% de 1RM concêntrico; PE/E: protocolo excêntrico realizado com 95% de 1RM excêntrico. Todos os protocolos foram constituídos de três repetições com 95% da carga de 1RM concêntrico ou excêntrico. Para análise dos dados foi utilizada a média, desvio padrão e para comparação das médias o teste de ANOVA com Post hoc de Tukey através do software SPSS versão 20. O índice de significância adotado foi p<0,05. Resultado: após a realização dos protocolos foi encontrado um aumento da força no momento pré para o momento pós de 17,2% na carga do teste de 1RM para PC/C, apresentado ser significativamente mais eficiente para geração da PPA quando comparado aos demais protocolos (p<0,01). Conclusão:recomenda-se o uso do PC/C para aumentar a força de forma aguda já que este se mostrou mais eficiente para o surgimento do fenômeno da PPA.

PALAVRAS-CHAVE: potencialização; ação muscular excêntrica; ação muscular concêntrica; força máxima.